NASA's ARSET Program: Building Capacity to Utilize Aura data for Air Quality Applications

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GESTAR/USRA/JCET/UMBC

EOS Aura Science Team Meeting, September 15-18, 2014
10th year anniversary celebration!

NASA Applied Sciences and Capacity Building

National and international activities to engage and train users applying NASA Earth Science satellites and modeling data in their decision making activities

NASA Satellite Images Will Help Farmers Conserve Water

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By VINNEE TONG

Listen 3:35

Flood irrigation in a Los Banos alfalfa field. 1 of 3

Vinnee Tong

NASA Applied Science : Capacity Building Program

Applied Remote SEnsing Training, ARSET (GSFC)

On-line and hands on basic/advanced trainings tailored to end-uses organizations

DEVELOP (LaRC national office)

Dual student/local government capacity building using collaborative projects

SERVIR Coordination Office (MSFC)

Building international capacity with hubs in

- East Africa
- Hindu Kush - Himalaya
- Mesoamerica

Gulf of Mexico Initiative, GOMI (SSC)

Building Gulf region's capacity for local environmental management

NASA Earth Science
Applied Sciences Program

Applications to Decision Making: Thematic Areas

Agricultural Efficiency

Air Quality

Climate

Disaster Management

Ecological Forecasting

Public Health

Water Resources

Weather

Applied Remote Sensing Training Program (ARSET)

GOAL:

Increase utilization of NASA observational and model data for decision-support

Online and hands-on courses:

- **Who:** policy makers, environmental managers, modelers and other professionals in the public and private sectors.
  Where: U.S and internationally
- **When**: throughout the year. Check websites.
- Do NOT require prior remote- sensing background.
- Presentations and hands-on guided computer exercises on how to access, interpret and use NASA satellite images for decision-support.

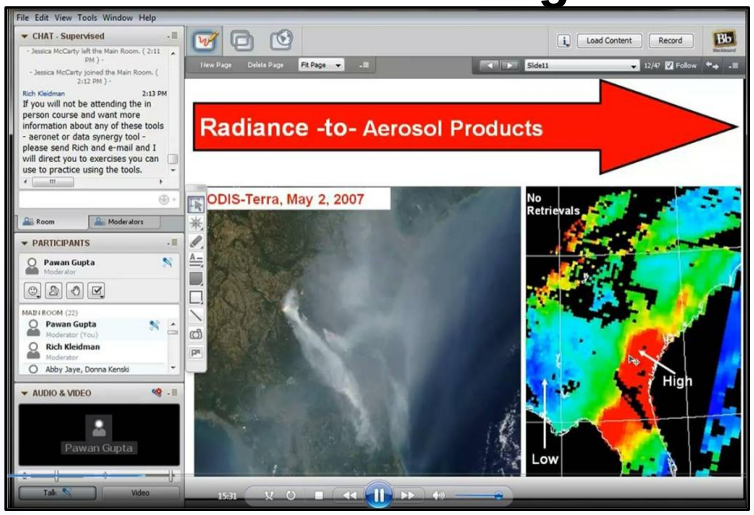
NASA Training for California Air Resources Board, Sacramento

Gradual Learning Approach

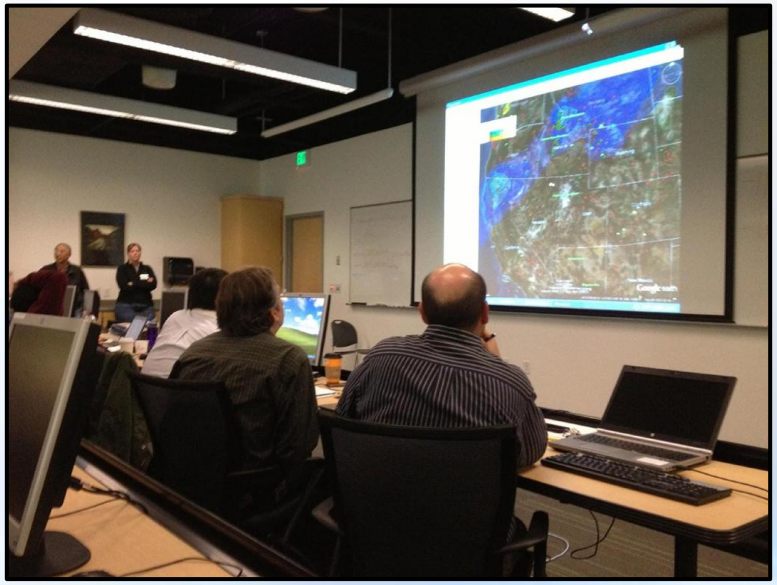
Basic Training
Webinars
Hands-on
Assumes no prior knowledge of RS

Advanced Training
Hands-on
Webinar course generally required
Focused on a specific application/problem/Data: for example dust or smoke monitoring in a specific country or region

Online Training



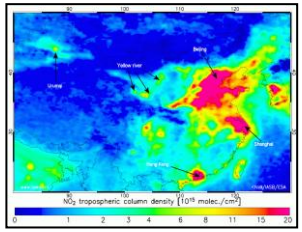
In-Person Training



Applied Remote Sensing Training Program (ARSET)

Health & Air Quality

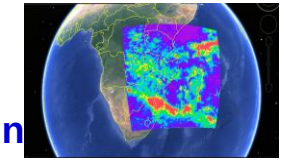
Nitrogen Dioxide over China



- 2008 – present
- 34 Trainings
- 1000+ end-users
- Analysis of dust, fires and urban air pollution.
- Long range transport of pollutants
- Satellite and regional air quality model inter-comparisons.
- Support for air quality forecasting and exceptional event analysis

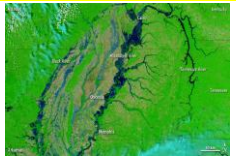
Water Resources and Flood Monitoring

Satellite derived precipitation



- April 2011 – present
- 9 Trainings
- 500+ end-users
- Flood/Drought monitorin
- Severe weather and precipitation
- Watershed management
- Climate impacts on water resources
- Snow/ice monitoring
- Evapotranspiration (ET), ground water, soil moisture, and runoff.

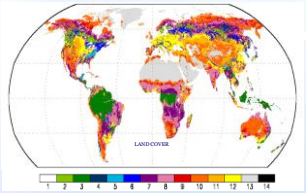
Inundation mapping



Land Use/Change and Ecology

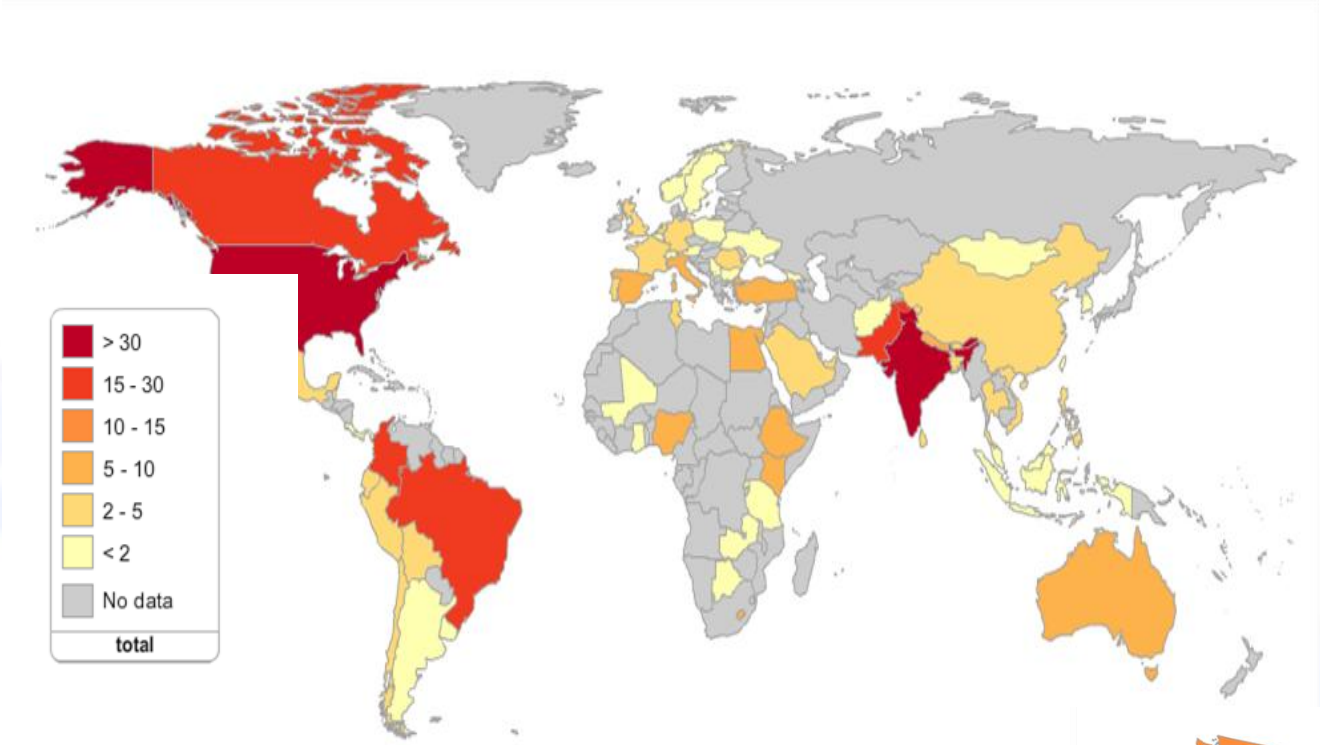
- First webinar just completed and in-person courses planned
- Focus on NGOs and Federal agencies
- GIS applications
- Land use/change and vegetation indices
- Fire products

Land Cover

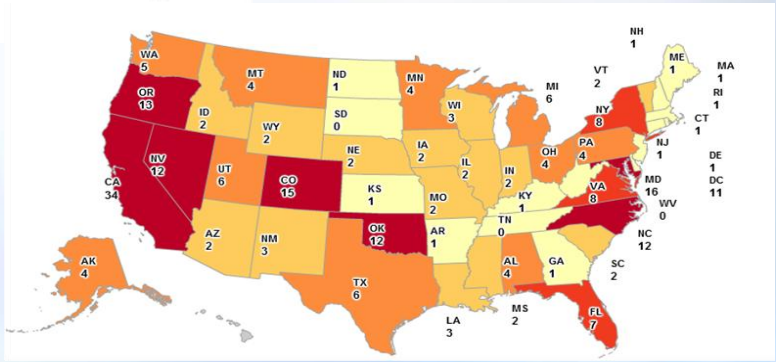


ARSET: 2009 – 2013

1500+ end-users reached
552 organizations



Number of participating organizations per country: Air Quality, Water Resources, Flood Monitoring.

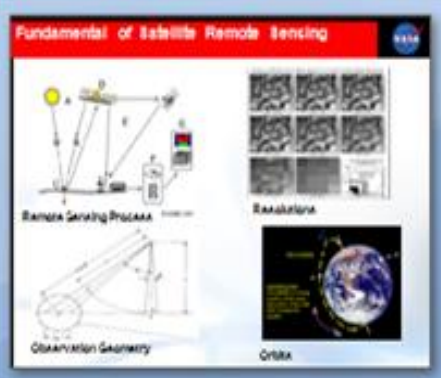


What is covered in a typical ARSET Air Quality Training?

Or

How is ARSET using AURA data

Satellite Data & Applications



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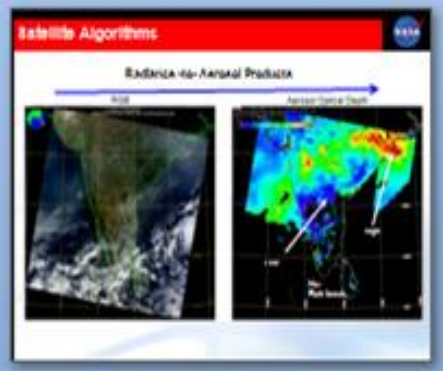

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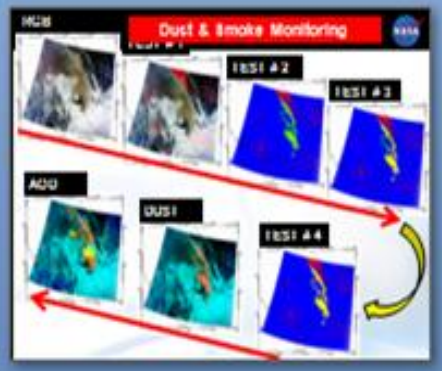

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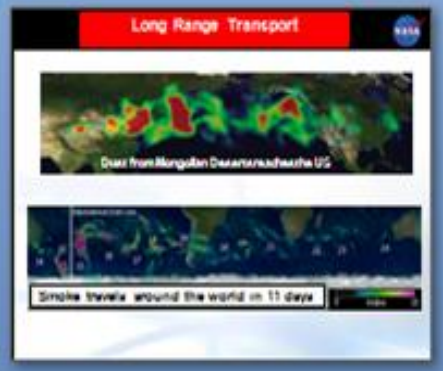

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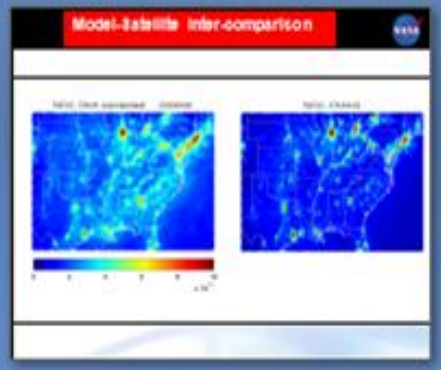
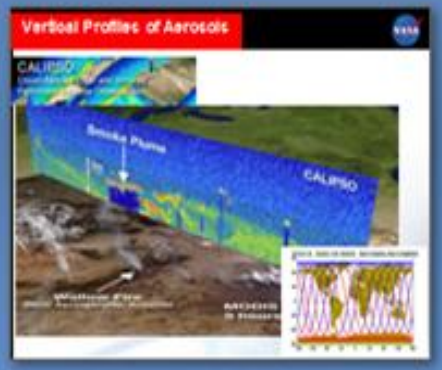




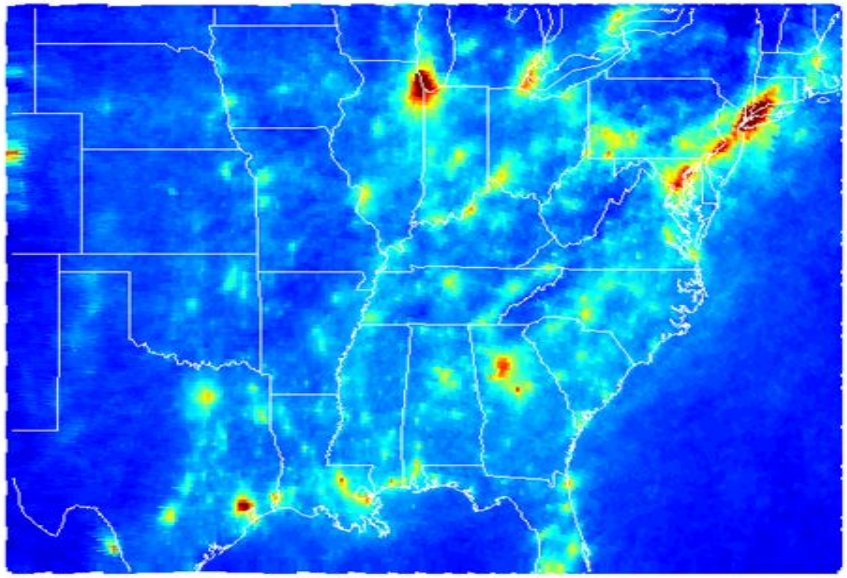
- MODIS
- OMI
- CALIPSO
- MISR
- VIIRS
- TRMM

Types of Training Modules

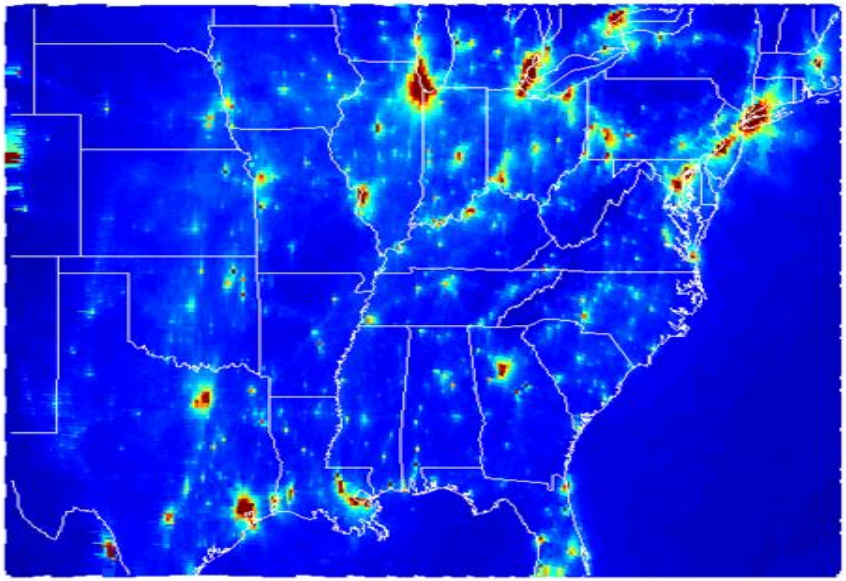
- **Trace Gas (OMI) imagery access and interpretation:**
  - Giovanni, MIRADOR
  - NASA AVDC
- **Case Studies in the application of Aura data for a specific area of interest,** e.g. Texas (Spring 2014), LADCO region (Midwest, 2013), NESCAUM/MARAMA (Fall 2013), California Air Resources Board (2010, 2011)
- **Benefits and limitations of Aura remote sensing products**

Model-Satellite Inter-comparison:

OMI NO2

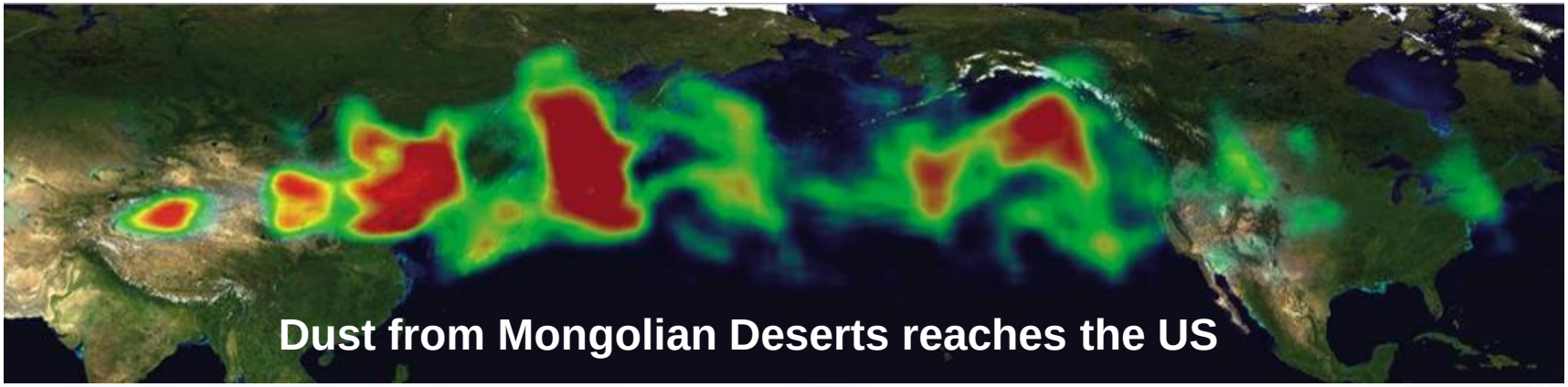


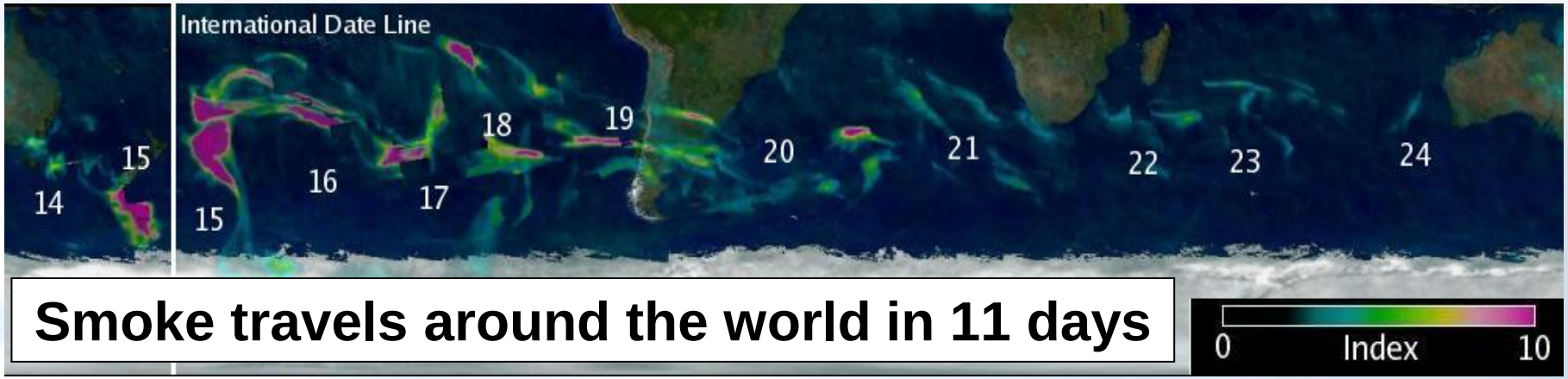
CMAQ NO2



- This application has been covered multiple times during ARSET trainings at the CMAS annual conference (2009 – 2013)
- **The RSIG EPA tool, which provided access to NASA and CMAQ data will be taught at a training at EPA RTP next week**

Long Range Transport: Accessible via Worldview and Giovanni

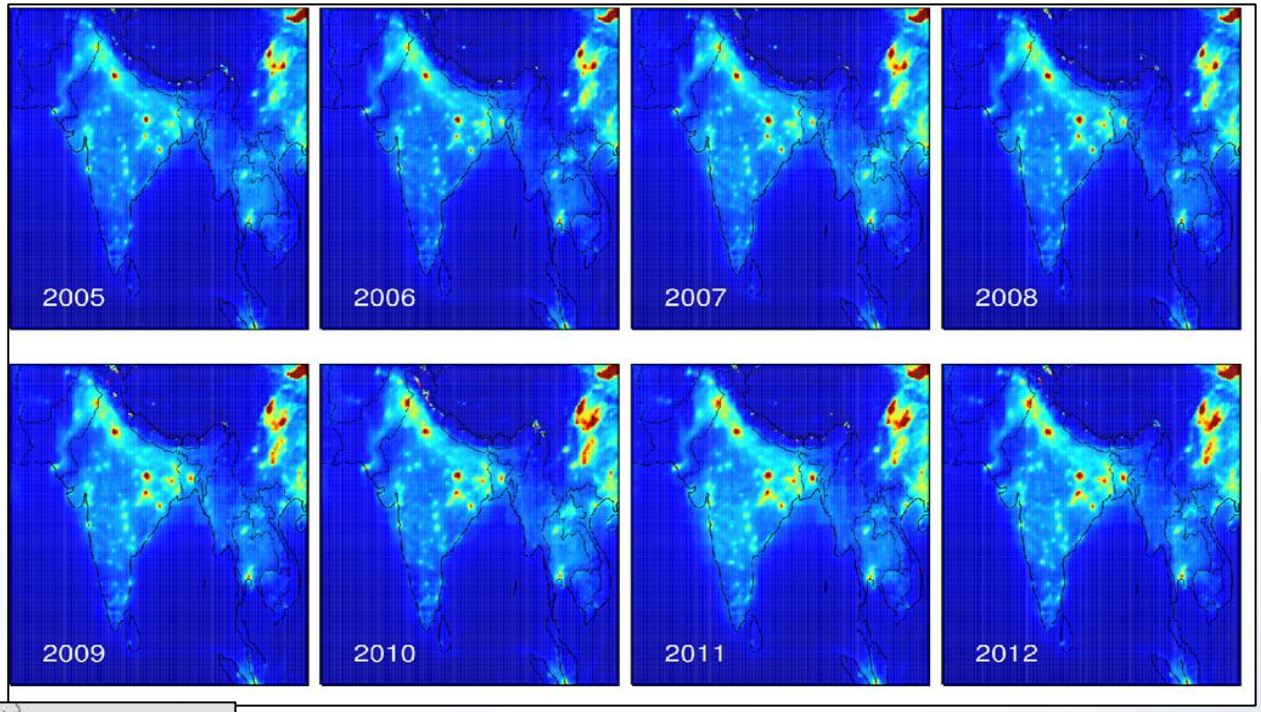




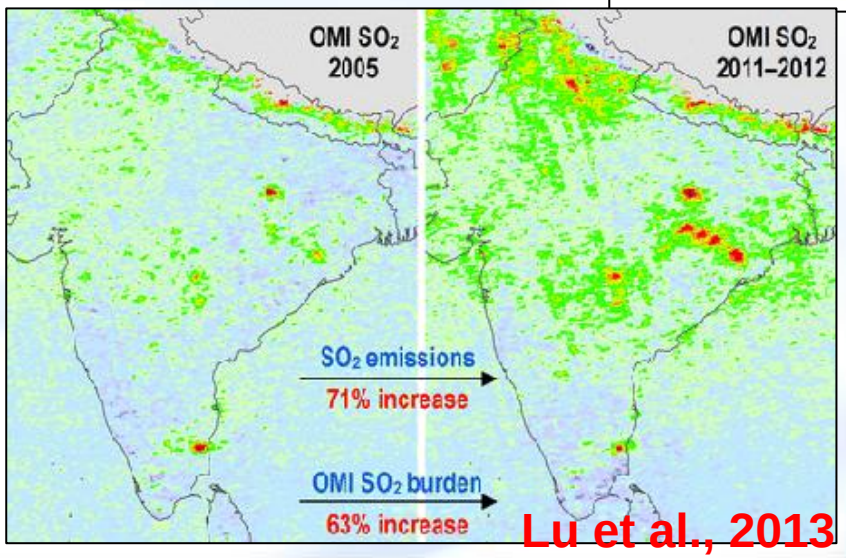
OMI Aerosol Index has been extensively used to track absorbing aerosols transport around the globe

Air Quality Trends: Webinar for the Indian Subcontinent, March 2014

OMI NO_2 Trends



courtesy: Lok Lamsal

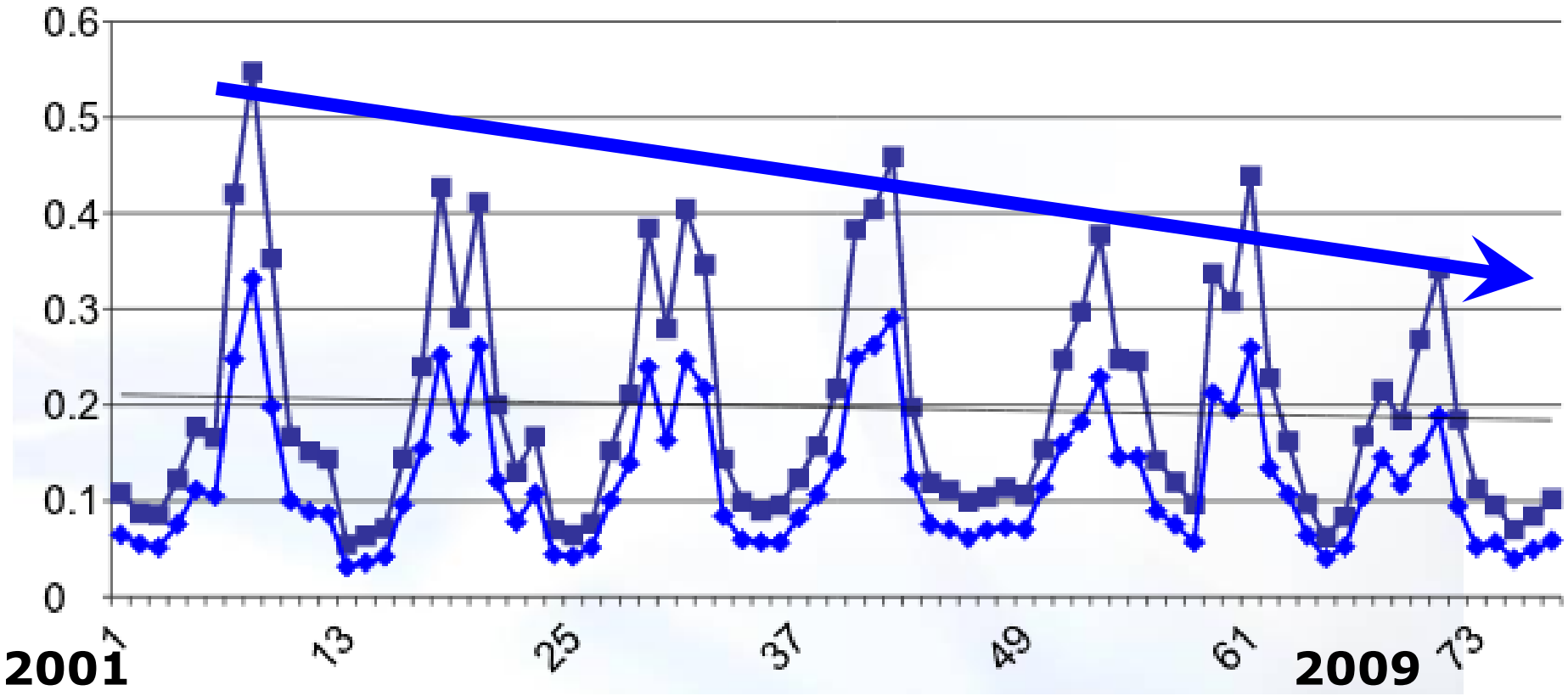


Lu et al., 2013

OMI SO_2 Trends

Level 2G and Level 3 data access and analysis modules are developed based on NASA online GIOVANNI tool

Air Quality Trends



- We provide examples of current or recent research applications
- Developed interactive exercises using Giovanni & L2 data for more advance users

Data User Guide

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(http://www.sciencedirect.com/science/article/pii/S1352231014004270)

An ARSET/AQAST Collaboration

http://arset.gsfc.nasa.gov/

Training Modules in English and Spanish

Updates on upcoming workshops

Data Product Tables

Links to popular NASA web tools for decision support